

PRELIMINARY DATASHEET

AD8309

FEATURES

Logarithmic Amplifier Performance

- 75 dBm to +20 dBm Dynamic Range
- 10 Stages, each having 12 dB gain & 750MHz BW
- Operates from 4MHz to 350 MHz
- ± 1.0 dB Log Conformance (max)
- Slope: 20 mV/dB $\pm 3\%$
- Intercept: -95dBm ± 3 dBm
- Extremely Temperature Stable
- Integral Low Pass Output Filter
- Pulse Response: Rise/Fall < 400ns

Limiter Performance

- ± 100 ps ($\pm 6^\circ$ @ 160MHz) Phase Skew
- 90dB Limiter Gain
- 350 MHz Limiter Bandwidth
- Fully Differential Limiter Output
- Programmable Limiter Output Level, 0-10mA

-80 dBm Noise Floor

Low Power

- + 3V, +5V Supply Operation
- Supply Current: 20mA Typ @ 5V
- CMOS compatible power down to 1 μ A
- 100ns Enable/Disable Switching time

16 Pin TSSOP

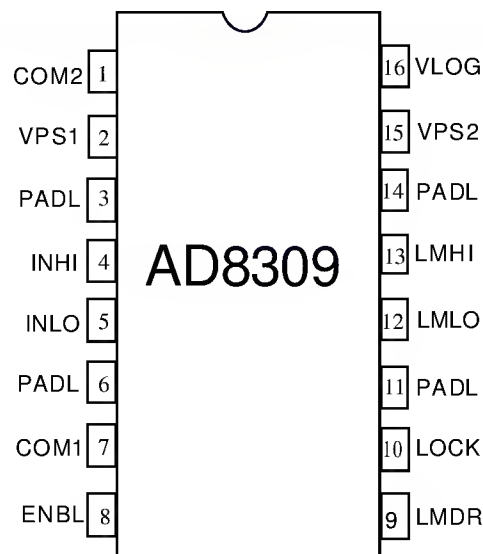
APPLICATIONS

- IF/RF Signal Processing
- Received Signal Strength Indicator (RSSI)
- High Speed Signal Compression
- Wide Dynamic Range Spectrum Analyzer
- ECM/Radar

PRODUCT DESCRIPTION

The AD8309 is a monolithic logarithmic amplifier using a 10 stage "successive-detection" technique, with each stage providing 12dB of gain. It provides both logarithmic and limiter outputs. It has been designed with attention to ease-of-implementation, temperature stability, minimizing external components, low power and low cost.

The logarithmic output (VLOG) is from a post demodulation low-pass filter and provides a loadable output voltage of 0.4V dc to 2.3V dc. The logarithmic scaling is such that the output is +0.4V for a sinusoidal input of -75 dBm and 2.3V at an input of +20 dBm. Over this range the logarithmic linearity is within ± 1 dB. All scaling parameters are internally tied to a band-gap reference. The filter for the log output provides a low pass corner at 4 MHz with a 400 ns full-scale response time (10-90%). The VLOG output is capable of driving a moderate load ($\geq 100\Omega$) to 2.5V.



ORDERING INFORMATION

Model	Package
AD8309ARU-REEL7	16 Lead Plastic TSSOP 7" Reel
AD8309ARU-REEL	16 Lead Plastic TSSOP 13" Reel
AD8309ARU	16 Lead Plastic TSSOP
AD8309-EB	Evaluation Board

Evaluation Board available at sampling

The limiter outputs (LMHI & LMLO) provide a hard-limited signal as a differential current from open collector outputs. The last cell is an output buffer which provides an adjustable and temperature-stable output. The output voltage is typically 400mV and is programmable by using R_{LIM} (resistor between LMDR and ground). The maximum output current is 10 mA.

The 350 MHz bandwidth, high accuracy and temperature stability make this product ideal for high speed signal power measurement in RF/IF systems (direct IF digitization). In addition, ECM/Radar designs are routinely measuring power in the 175-225 MHz frequency range. The bandwidth, accuracy, dynamic range and low noise render this part ideal for applications which require wide dynamic range capability for compression (log conversion) prior to digitization.

The AD8309 is available in the industrial (-40° to $+85^\circ$ C) temperature range in the 16 lead TSSOP package.

AD8309 SPECIFICATIONS

ELECTRICAL CHARACTERISTICS ($V_S = +5V$; $R_{LOAD} = 50\Omega$, $T_A = +25^\circ C$; $f = 200MHz$ unless otherwise noted)

		AD8309			
Parameter	Condition / Note	Min	Typical	Max	Units
LOG AMPLIFIER RF PERFORMANCE					
Demodulation Bandwidth		300	350		MHz
Dynamic Range	Single Sided Input		95		dB
	Differential Input		97		dB
Log Conformance (Accuracy)			±0.5	±1.0	dB
Minimum Output Voltage				0.4	V
Maximum Output Voltage	R _L > 100Ω	2.5			
Logarithmic Intercept		-98	-95	-92	dBm
Logarithmic Slope		19.4	20	20.6	mV/dB
High Pass Corner	Lock unconnected or low		4		MHz
VIDEO FILTER					
Low Pass Filter Corner		3	4		MHz
Small Signal Response Time			100		ns
Response Time	10-90%		400	500	ns
LIMITER PERFORMANCE					
Limiter Sensitivity	Within 3 dB of Max Output		-80		dBm
Limiter Gain			90		dB
Limiter Bandwidth		300	350		MHz
Limiter Bias Voltage	V _{LIM} , LMDR to COMM	390	400	450	mV
Output Current	V _{LIM} /R _{LIM}			10	mA
Phase Skew	-75dBm to +5dBm		±100	ps	
Maximum Output Voltage		1	1.2		V
NOISE PERFORMANCE					
Spectral Input Noise Voltage	1 kHz to 10 MHz		1		nV/√Hz
Noise Floor	Z _{SOURCE} < 25Ω		-80		dBm
INPUT CHARACTERISTICS					
Input Resistance	INHI to INLO		600		Ω
Input Capacitance	INHI to INLO		1.5		pF
Input DC Reference Level	Independent of Supply Voltage		1.75		V
Input Offset Voltage	Differential- AutoNulling		50	500	μV
Input Bias Current			15	30	μA
Maximum Input	Single-sided		20	22	dBm
POWER SUPPLY					
Supply Voltage (+V _S)		2.7		7.5	V
Quiescent Current			18	24	mA
Powerdown Current	V _{ENBL} = 0V		1		μA
Enable Logic Threshold			1.5		V
Enable Input Current	V _{ENBL} = 3V		40	60	μA